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ABSTRACT

This study sought to determine if there was a difference in teaching effectiveness of entry-level 1-year vocationally certified teachers of vocational agriculture and entry-level 4-year provisionally certified teachers of vocational agriculture. Correlations were computed using performance on the teaching test, teacher educator ratings, students' evaluation, and Observational System for Instructional Analysis (OSIA) ratios. All of the data were classified as interval data except for the teaching performance test data, which were classified as nominal according to whether or not there was a significant difference between the pretest and posttest scores. Four conclusions resulted: (1) Generally the entry-level 4-year provisionally certified teachers are more effective teachers than the 1-year vocationally certified teachers, (2) indirective teachers are more effective than directive teachers, (3) 4-year provisionally certified teachers are more indirective than 1-year vocationally certified teachers, and (4) students recognize the technical agriculture expertise of the 1-year vocationally certified teachers. The major implication is that due to the great variance in teaching ability of the 1-year vocationally certified teachers it appears that better methods of screening prospective teachers should be developed. Examples of the lesson plan and the teaching performance test are appended. (TA)

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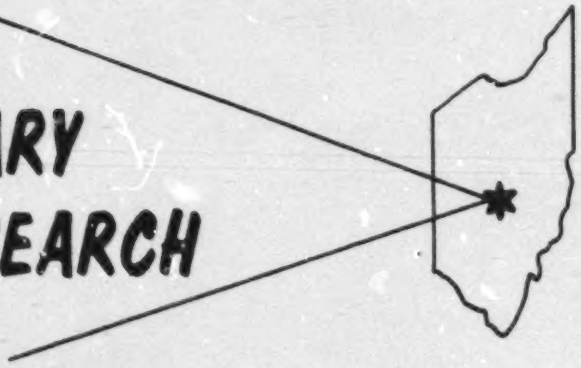
SUMMARY OF RESEARCH



DEPARTMENT OF AGRICULTURAL EDUCATION

The Ohio State University
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TEACHING EFFECTIVENESS OF TWO GROUPS OF BEGINNING TEACHERS OF VOCATIONAL AGRICULTURE

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Gary E. Moore and Ralph E. Bender

INTRODUCTION

The rapid expansion of vocational education during the last decade has created a teacher shortage in several vocational fields. Vocational agriculture has been one of the areas in which a severe teacher shortage exists.

The seriousness of the teacher shortage in vocational agriculture was documented in studies on teacher supply and demand (Woodin, 1974). During a nine-year period from 1965-1973 the number of teachers needed in vocational agriculture in the United States but not available as of August 1 of the year averaged 164. This ranged from a low of 120 teachers needed in 1965 to a high of 276 teachers needed for the 1973-74 school year.

To help relieve this teacher shortage, several states have recruited people from agricultural business and industry to teach vocational agriculture. These people normally had at least a high school degree and several years of occupational experience. This has been a relatively new practice in agricultural education even though other vocational education areas have been doing this for years.

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TEACHING EFFECTIVENESS OF TWO GROUPS OF BEGINNING TEACHERS OF VOCATIONAL AGRICULTURE

In Ohio, teachers have been actively recruited from industry to teach vocational agriculture since 1972. These teachers have attended a four-week credit workshop at The Ohio State University during the summer preceding the start of the school year. The workshop provided an accelerated orientation to vocational agriculture and teaching methods. During the school year these teachers have been supervised by a teacher educator twice each month. Following their first year of teaching, the teachers participated in a two-week credit workshop. They received a one-year vocational teaching certificate. The teachers who completed the regular four-year college teacher education program received a four-year provisional teaching certificate.

The practice of recruiting teachers from industry has raised some questions and created some controversy among educators. Some factions claim that teachers recruited from industry are unprofessional and damage the image of vocational agriculture teachers. Other segments claim that teachers from industry are superior teachers because of their practical experience in industry. Yet others point to the 25-30% annual turnover of first year "industry" teachers as a sign of their not being able to teach successfully.

PURPOSE

The purpose of the study was to answer the following questions:

1. Is there a difference in teacher effectiveness as measured by student achievement between the entry-level four-year provisionally certified and entry-level one-year vocationally certified teachers of vocational agriculture?

2. Is there a difference in teacher effectiveness as determined by teacher educator evaluations between the entry-level four-year provisionally certified and entry-level one-year vocationally certified teachers of vocational agriculture?

3. Is there a difference in teacher effectiveness as perceived by high school students between the entry-level four-year provisionally certified and entry-level one-year vocationally certified teachers of vocational agriculture?

4. Is there a difference in teacher behavior thought to influence teacher effectiveness between entry-level four-year provisionally certified and entry-level one-year vocationally certified teachers of vocational agriculture?

5. Is there a relationship between student ratings of teachers, teacher educator ratings of teachers, and the teaching effectiveness of teachers, as determined by student achievement?

6. Is there a relationship between teacher behavior and teacher effectiveness as determined by student achievement?

METHODOLOGY AND FINDINGS

This study consisted of several phases. Each phase was designed to answer one of the above stated questions.

Phase I - Teaching Performance Test

The use of teaching performance tests to determine teaching effectiveness has been advocated (McNeil and Popham, 1973). In teaching performance tests, teachers are given a teaching unit with explicit student behavioral objectives. These units are taught to similar groups of students that have been pretested. After instruction the students are administered a posttest. The difference between the pretest and posttest is an indication of the effectiveness of the teachers.

To determine if there was a difference in the teaching effectiveness of one-year vocationally certified teachers and four-year provisionally certified teachers twenty-four single concept lessons were developed using the Curriculum Guides for High School Vocational Agriculture (USOE 1974). Each lesson had two or three specific behavioral objectives to be accomplished. No subject matter was included in the lesson. An attempt was made to develop lessons that had commonality across specialization areas (i.e., a lesson on fertilizers could be taught by both horticulture teachers and production agriculture teachers). A short multiple choice test was developed for each lesson. An example of the lesson plan and test is appended.

Sixteen entry-level one-year vocationally certified teachers were selected at random from the thirty-four teachers attending the four-week teacher preparation workshop during the summer of 1974. Each teacher drew a lesson at random from a box containing the lessons for his specialty area. The teachers were given one week to prepare to teach the lesson. They were allowed to use any available resources and could teach the lesson in any manner they wished.

These lessons were taught to high school vocational agriculture students who were selected through a multistage sampling technique from twenty-four schools within a 25 mile radius of the University. The students were brought to the university and randomly divided into two classes. The entry-level one-year vocationally certified teachers were randomly divided into two groups. Each group of teachers taught one of the classes. Each class was given a pretest over the material that was to be taught to the other class in an attempt to prevent pretest sensitization. After each teacher taught his topic a posttest was immediately administered to the students he had taught.

The same procedure was used with the four-year provisionally certified teachers. Sixteen teachers were randomly selected from among the 21 students who completed student teaching during the Autumn Quarter of 1974.

Fifteen of the one-year vocationally certified teachers and fourteen of the four-year provisionally certified teachers were able to participate in this phase of the study.

Findings for the Teaching Performance Test

To determine the degree of effectiveness for each teacher, the mean posttest score of the students taught by each teacher was compared with the mean pretest score of the comparable group of students. A one-tailed independent sample t-test was used in the analysis. If the difference in scores was significant at the .05 level, the teacher was classified as being more effective.

Of the fifteen entry-level one-year vocational certified teachers, seven were classified as effective. These results are presented in Table 1.

Table 1

RESULTS ON THE TEACHING PERFORMANCE TEST OF THE ENTRY-LEVEL ONE-YEAR VOCATIONALLY CERTIFIED TEACHERS OF VOCATIONAL AGRICULTURE (n=15)

Lesson Topic	Number of Test Items	Number of Students Taking the Test	Mean Pretest Score	Number of Students Taking the Posttest	Mean Posttest Scores	t-Value
Grafting	8	12	2.00	11	6.55	6.04*
Fertilizers	8	12	3.17	11	5.91	4.13*
Small gas Engines	6	11	4.08	10	4.80	1.09
Sexual Propagation	7	12	2.92	13	3.92	1.31
Batteries	5	12	2.50	12	3.25	1.68
Thermostats	6	12	2.92	11	4.31	2.30*
Generators	5	13	3.00	12	3.50	0.81
Bearings	4	12	1.50	13	1.54	0.11
Piston Rings	5	13	2.77	12	2.92	0.28
Soil Erosion	4	13	2.00	12	2.42	1.05
Solid Waste Management	4	12	1.83	13	3.54	4.17*
Planting Media	4	12	1.33	11	1.27	0.15
Asexual Propagation	7	13	2.00	12	5.17	7.56*
Timber Cruising	6	11	3.92	10	5.40	3.34*
Electrical Wires	6	13	2.38	12	4.58	3.78*

*Significant at the .05 level of significance using a one-tailed test

Of the 14 four-year provisionally certified teachers participating in the study, one case was deleted because of an exceptionally high mean pretest score. Of the remaining 13 teachers, 11 had significant differences between the posttest and pretest scores of comparable students on the topics they taught. These results are presented in Table 2.

Table 2

RESULTS ON THE TEACHING PERFORMANCE TEST OF THE ENTRY-LEVEL FOUR-YEAR PROVISIONALLY CERTIFIED TEACHERS OF VOCATIONAL AGRICULTURE

Lesson Topic	Number of Test Items	Number of Students Taking the Pretest	Mean Pretest Score	Number of Students Taking the Posttest	Mean Posttest Scores	t-Value
Grafting	8	11	4.27	11	6.91	4.13*
Fertilizers	8	11	4.82	11	6.00	1.40
Small Gas Engines	6	11	2.45	11	4.91	3.24*
Sexual Propagation	7	11	3.45	11	5.27	5.35*
Batteries	5	11	2.91	11	3.45	0.86
Thermostats	6	11	3.82	11	5.00	2.02*
Generators	5	11	2.82	11	3.73	1.82*
Bearings	4	11	1.73	11	2.27	1.80*
Piston Rings	5	11	2.00	11	3.27	2.71*
Soil Erosion	4	11	1.73	11	3.11	3.37*
Solid Waste Management	4	11	3.18	This case dropped because of high pretest score.		
Dressing Percentages	4	11	2.09	11	3.18	3.52*
Electrodes	7	11	2.09	11	3.91	3.76*
Oils	6	11	4.36	11	5.36	2.04*

*Significant at the .05 level of significance using a one-trailed test.

A comparison of the two groups reveals that 47 percent of the entry-level one-year vocationally certified teachers instructed students having significant differences between the posttest and pretest scores, while 85 percent of the entry-level four-year provisionally certified teachers instructed students having significant differences between the pretest and posttest scores. Using these two numbers as proportions and performing a t-test for proportions ($\bar{z}$ ratio described by Guilford and Fruchter, 1973), a value of 2.24 was obtained. This is significant at the .05 level using a two-tailed test. These data are presented in Table 3.

Table 3

COMPARISON OF ENTRY-LEVEL FOUR-YEAR PROVISIONALLY CERTIFIED AND ONE-YEAR VOCATIONALLY CERTIFIED TEACHERS OF VOCATIONAL AGRICULTURE ON THE TEACHING PERFORMANCE TESTS

Type of Teacher	Number of Teachers	Proportion of Teachers Having Significant Differences Between Pretest and Posttest Scores	$\bar{z}$ - value
Entry-Level Four-Year Provisionally Certified	13	.85	2.24*
Entry-Level One-Year Vocational Certified	15	.47	

*Significant at the .05 level of significance using a two-tailed test.

Phase II - Teacher Education Ratings

Each teacher was rated by a teacher educator. The four-year provisionally certified teachers were observed by a teacher educator two or three times during their quarter of student teaching. The one year vocationally certified teachers were observed twice a month during their first year of teaching by a teacher educator. Using the same criteria each teacher was assigned a combination of three grades by the teacher educators. The grades were assigned to the four-year provisionally certified teachers at the end of student teaching in December of 1974. The grades were assigned to the one-year vocationally certified teachers during March of 1975 after six months of teaching experience.

The 15 entry-level one-year vocationally certified teachers received a mean rating of 2.58 on a four-point scale which is reported in Table 4.

Table 4

TEACHER EDUCATOR RATINGS OF ENTRY-LEVEL ONE-YEAR VOCATIONALLY CERTIFIED TEACHERS OF VOCATIONAL AGRICULTURE

Rating	Grade-Point Average of the Rating	Number of Teachers Receiving the Rating	Percentage of Teachers Receiving the Rating
AAB	3.67	2	13
ABB	3.33	1	7
BBB	3.00	1	7
BBC	2.67	2	13
BCC	2.33	7	47
CCC	2.00	1	7
CDD	1.33	1	7
Totals $\bar{X}$ = 2.58		15	100

The 13 entry-level four-year provisionally certified teachers received a mean rating of 3.03 by the teacher educators as may be found in Table 5.

Table 5

TEACHER EDUCATOR RATINGS OF ENTRY-LEVEL FOUR-YEAR PROVISIONALLY CERTIFIED TEACHERS OF VOCATIONAL AGRICULTURE

Rating	Grade-Point Average of the Rating	Number of Teachers Receiving the Rating	Percentage of Teachers Receiving the Rating
AAB	3.67	3	22
ABB	3.33	1	8
BBB	3.00	4	31
BBC	2.67	4	31
BCC	2.33	1	8
Totals $\bar{X}$ = 3.03		13	100

A comparison of the two groups reveal a significant difference in the teacher educators' ratings for the entry-level four-year provisionally and one-year vocationally certified teachers. A t-value of 2.79 was obtained on the difference in ratings which is significant at the .05 alpha level using a two-tailed test. These data are presented in Table 6.

Table 6

COMPARISON OF ENTRY-LEVEL FOUR-YEAR PROVISIONALLY CERTIFIED AND ONE-YEAR VOCATIONALLY CERTIFIED TEACHERS OF VOCATIONAL AGRICULTURE ON TEACHER EDUCATOR RATINGS

Type of Teacher	Number of Teachers	Mean Rating	Standard Deviation	t-Value
Entry-Level Four-Year Provisionally Certified	13	3.03	0.441	2.79*
Entry-Level One-Year Vocationally Certified	15	2.58	0.605	

*Significant at the .05 level of significance using a two-tailed test.

Phase III - Student Ratings of Teachers

The third phase of this study involved a rating of each teacher by his students. The four-year provisionally certified teachers were rated at the completion of student teaching in December of 1974 by the high school students they had taught while student teaching. There were 457 student evaluations, averaging 35 ratings for each entry-level four-year provisionally certified teacher.

The entry-level one-year vocationally certified teachers were rated by their high school students during March of 1975. There were 202 student evaluations for the 12 teachers who participated in this phase of the study, averaging 17 ratings per teacher. (The researcher recognizes the difference in the time of the evaluation by students as a limitation in the study.)

The instrument used to rate both groups of teachers consisted of ten items. In comparing the students' ratings of the two groups of teachers there were two items that were significantly different. The one-year vocationally certified teachers were rated significantly higher on knowledge of the subject while the four-year provisionally certified teachers were rated significantly higher on fairness. There was no significant difference on the students' ratings of all around teaching ability of the two groups of teachers (Item 10). A comparison of the ratings is found in Table 7.

Table 7

COMPARISON OF STUDENT RATINGS OF ENTRY-LEVEL FOUR-YEAR PROVISIONALLY CERTIFIED AND ONE-YEAR VOCATIONALLY CERTIFIED TEACHERS OF VOCATIONAL AGRICULTURE (n=25)

Evaluation Item	Mean Four-Year Provisionally Certified Teacher Rating[a] (n=13)	Mean One-Year Vocationally Certified Teacher[b]	t-value
1. Teacher's knowledge of the subject	3.09	3.48	3.65*
2. Teacher's explanation	2.93	2.93	0.01
3. Fairness of the teachers	3.08	2.75	2.70*
4. Teacher's ability to maintain discipline	2.69	2.65	0.23
5. Teacher is sympathetic	3.09	3.10	0.08
6. Amount the student is learning	2.95	3.08	1.09
7. Class is interesting	3.02	3.05	0.19
8. The teacher is business-like	2.92	3.01	0.68
9. Value of the subject	3.08	3.12	0.28
10. All around ability of the teacher	2.93	3.02	0.67

*Significant at the .05 level of significance using a two-tailed test.

a,b - The rating scale was Excellent = 4, Good = 3, Average = 2, and Below Average = 1.

Phase IV - Analysis of Teaching Behaviors

As each teacher participated in the teaching performance phase of this study he was videotaped. The teaching behaviors of each teacher were classified by an expert who analyzed each videotape using the Observational System for Instructional Analysis (Hough and Duncan, 1970).

The behaviors that were of prime interest to the investigator were the indirect/direct ratio, the modified indirect/direct ratio, and the student behavior/teacher behavior ratio. These behaviors indicate the degree of student input and involvement in the lesson. The teachers with high ratios are classified as indirective while those with low ratios are classified as directive.

The entry-level four-year provisionally certified teachers had a mean indirect/direct ratio of .58 and a modified indirect/direct ratio of .93. The student behavior ratio was .26. These data are compared in Table 8. It should be noted there is a significant difference in two of the ratios; those being the indirect/direct ratio, and the modified indirect/direct ratio.

Table 8

TEACHING BEHAVIORS OF ENTRY-LEVEL FOUR-YEAR PROVISIONALLY CERTIFIED AND ONE-YEAR VOCATIONALLY CERTIFIED TEACHERS OF VOCATIONAL AGRICULTURE

Behavior	Mean Four-Year Provisionally Certified Teacher Ratio (n=13)	Mean One-Year Vocationally Certified Teacher Ratio (n=15)	t-value
Indirect/direct ratio	.58	.37	3.12*
Modified indirect/direct ratio	.93	.77	2.90*
Student behavior/teacher behavior ratio	.26	.20	1.47

*Significant at the .05 level of significance using a two-tailed test.

In an effort to learn more about teaching effectiveness these data were regrouped. All teachers, regardless of type of teaching certificate, who had significant differences between the pretest and posttest scores were compared with the teachers who did not have significant differences between the pretest and posttest scores on the teaching performance tests. This analysis was designed to provide an indication of the value of the ratios in predicting achievement by students. Again significant differences were found between two of the ratios; those being the modified indirect/direct ratio and the ratio of student behaviors to teacher behaviors. These data are presented in Table 9.

Table 9

COMPARISON OF TEACHING BEHAVIORS OF ENTRY-LEVEL FOUR-YEAR PROVISIONALLY CERTIFIED AND ONE-YEAR VOCATIONALLY CERTIFIED TEACHERS WHO DID AND DID NOT HAVE SIGNIFICANT DIFFERENCES BETWEEN PRETEST AND POSTTEST SCORES OF COMPARABLE STUDENTS

Behavior	Teachers With Significant Differences (n=18)	Teachers Without Significant Differences (n=10)	t-value
Indirect/direct ratio	.51	.39	1.56
Modified indirect/direct ratio	.92	.71	2.07*
Student behavior/teacher behavior ratio	.26	.17	2.37*

*Significant at the .05 level using a two-tailed test.

Phase V - Correlations

Correlations were computed using performance on the teaching test, teacher educator ratings, students evaluation, and OSIA ratios. All of the data were classified as interval data except for the teaching performance test data which were classified as nominal data according to whether or not there was a significant difference between the pretest and post-test scores. The correlations are presented in Table 10.

Table 10

CORRELATION COEFFICIENTS FOR THE ENTRY-LEVEL TEACHERS

Variables	Correlation	Significance Level
1. Teacher educator ratings and teaching performance test (n=28)	.29	.07
2. Students' rating and teaching performance test (n=25)	.11	.30
3. Teacher educator ratings and students rating (n=25)	.16	.22
4. Teacher educator ratings and indirect/direct ratio (n=28)	.61	.001
5. Teacher educator ratings and the modified indirect/direct ratio (n=28)	.21	.15
6. Teacher educator ratings and student behavior/teacher behavior ratio (n=28)	.44	.01
7. Teaching performance test and indirect/direct ratio (n=28)	.28	.07
8. Teaching performance test and modified indirect/direct ratio (n=28)	.49	.15
9. Teaching performance test and student behavior/teacher behavior ratio (n=28)	.40	.02

CONCLUSIONS AND IMPLICATIONS

Conclusions:

1. Generally the entry-level four-year provisionally certified teachers are more effective teachers than the one-year vocationally certified teachers.

2. Indirective teachers are more effective than directive teachers.

3. Four-year provisionally certified teachers are more indirective then one-year vocationally certified teachers.

4. Students recognize the technical agriculture expertise of the one-year vocationally certified teachers.

Implications:

1. Due to the great variance in teaching ability of the one-year vocationally certified teachers it appears that better methods of screening prospective teachers should be developed.

2. Educators need to re-examine the number of years of occupational experience required for the one-year vocationally certified teachers.

3. Teacher educators should emphasize the use of indirective teaching methods.

4. Due to the low correlations between student ratings and student achievement, careful consideration should be given to how student evaluations are used in education.

5. The possibility of differentiated staffing in which a school has both types of teachers needs to be further explored.

6. Additional work should be done on the development and validation of teaching performance tests as a tool in teacher education.

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1. Career Preparation in Agricultural Production: A Curriculum Guide for High School Vocational Agriculture
2. Career Preparation in Agricultural Supplies and Services: A Curriculum Guide for High School Vocational Agriculture
3. Career Preparation in Agricultural Products: A Curriculum Guide for High School Vocational Agriculture
4. Career Preparation in Ornamental Horticulture: A Curriculum Guide for High School Vocational Agriculture
5. Career Preparation in Agricultural Resources: A Curriculum Guide for High School Vocational Agriculture
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APPENDIX

TEACHING PERFORMANCE UNIT B

Taxonomy Area: Horticulture

Teaching Unit: Fertilization

Lesson Topic: Fertilizer Formulas

Teacher's Situation: Your students will be using fertilizers in landscaping, floriculture, arboriculture, nursery production, and turf maintenance. They will need to be familiar with fertilizer formulas and how the formula relates to the three primary nutrients.

Student Behavioral Objectives:

1. The student will be able to list the three primary elements needed for plant growth.

2. When given a fertilizer formula the student will be able to match the correct elements to the numbers in the formula.

3. When given several fixed analysis fertilizers, the student will determine the pounds of actual plant food for each primary nutrient and the total pounds of actual nutrients in the fertilizer.

AGRICULTURAL EDUCATION – TEST 'B'

Directions: Read the question carefully, choose the one best answer and place the letter that represents the best answer in the blank beside the question. If you need to do any figuring you may use the backs of the pages.

_____ 1. Of the following which is not a primary plant element?

A. Iron
B. Phosphorus
C. Potassium
D. Nitrogen

_____ 2. In a fertilizer with a formula of 15-10-5 the number that represents nitrogen is:

A. 15
B. 10
C. 5
D. 30

_____ 3. A florist bought 200 pounds of 12-18-10 fertilizer to put on her flowers. If the florist put the entire 200 pounds on the flowers, what is the total pounds of actual primary elements applied to the flowers?

A. 12 pounds
B. 40 pounds
C. 80 pounds
D. 200 pounds

_____ 4. In a 15-10-5 fertilizer the number that stands for phosphorus is:

A. 15
B. 10
C. 5
D. 30

_____ 5. In a 50 pound bag of fertilizer having an analysis of 15-10-5 how many pounds of phosphorus are present?

A. 15
B. 10
C. 5
D. 30

____ 6. How many pounds of available phosphate are there in this bag of fertilizer?

A. 6 pounds
B. 8 pounds
C. 12 pounds
D. 24 pounds

____ 7. How many pounds of potash are there in the bag of fertilizer pictured in question number 6?

A. 6 pounds
B. 8 pounds
C. 12 pounds
D. 24 pounds

____ 8. In a 15-10-5 fertilizer the number that stands for potash is:

A. 15
B. 10
C. 5
D. 30

SUMMARY OF RESEARCH SERIES

The field of vocational education in agriculture has experienced rapid growth and development in recent years. Much of this growth in Ohio has been in the specialized areas of horticulture, agricultural business, agricultural mechanics, agricultural resources, and small animal care. The chronic teacher shortage became even more serious because of insufficient numbers trained in specialty areas. A significant portion of entering teachers in recent years have been recruited from business and industry.

This summary is based on a doctoral dissertation completed by Gary E. Moore under the direction of Ralph E. Bender. Dr. Moore is an Assistant Professor in The Department of Agribusiness Education at Alabama A & M University, Normal. Dr. Bender is Professor and Chairman, Department of Agricultural Education, The Ohio State University. Special appreciation is due Harold R. Crawford, Professor and Head, Agricultural Education, Iowa State University, Ames and Ralph J. Woodin, Professor Emeritus, Agricultural Education, The Ohio State University for their critical review of this manuscript prior to publication.

Research has been an important function of the Department of Agricultural Education since it was established in 1917. Research conducted by the Department has generally been in the form of graduate thesis, staff studies and funded research. It is the purpose of this series to make useful knowledge from such research available to practitioners in the profession. Individuals desiring additional information on this topic should examine the references cited in the bibliography.

J. David McCracken
Associate Professor

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